BOUGAINVILLE INDUSTRIAL PARK OFF-SITE SEWERS SUPPLEMENTARY SOIL EXPLORATION REPORT

HALAWA, EWA, OAHU, HAWAII
TAX MAP KEY: 9-9-02: POR. 4, 23 & 34

To:
COMMUNITY PLANNING, INC.

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

JULY 29, 1976

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

WALTER LUM
EDWARD WATANABE
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3030 WAIALAE AVE., HONOLULU, HAWAII 96816 • TEL. 737-7931

July 29, 1976

MR. GEORGE HOUGHTAILING
Community Planning, Inc.
700 Bishop Street, Suite 608
Honolulu, Hawaii 96813

Dear Mr. Houghtailing:

Subject: Bougainville Industrial Park Off-site Sewers
Supplementary Soil Exploration Report
(for foundation design purposes)
Halawa, Ewa, Oahu, Hawaii
Tax Map Key: 9-9-02: Por. 4, 23 & 34

Transmitted herewith is our supplementary soil exploration report for the proposed sewer line. A soil report, "Bougainville Industrial Park Off-site Sewers," dated April 11, 1975, was prepared by us for sewer pipe bedding design purposes. However, the sewer line between Manhole Nos. 5 and 8 has been realigned and installation of the sewer line by an alternate method of tunneling from Manhole Nos. 5 thru 12 is being considered.

This report includes a Revised Boring Location Sketch, additional boring logs, laboratory test results, general tunnel design guidelines and limitations.

Respectfully submitted,

WALTER LUM ASSOCIATES, INC.

By Edward K. Watanabe
Edward K. Watanabe

CM/EKW:vl

C O N T E N T S

BOUGAINVILLE INDUSTRIAL PARK OFF-SITE SEWERS
SUPPLEMENTARY SOIL EXPLORATION REPORT

HALAWA, EWA, OAHU, HAWAII
TAX MAP KEY: 9-9-02: POR. 4, 23 & 34

SCOPE OF EXPLORATION

The purpose of this soil exploration was to supplement our soil exploration report, "Bougainville Industrial Park Off-site Sewers," April 11, 1975. The sewer line between Manhole Nos. 5 and 8 has been realigned and the installation of the sewer line by an alternate method of tunneling between Manhole Nos. 5 and 12 is being considered.

This supplementary report covers only the portion of the project between Manhole Nos. 5 and 12.

This report has been prepared for the exclusive use of Community Planning, Inc. and their design consultants as a guide in the design of this specific project. The report has not been prepared for use by other parties and may not contain sufficient information for other uses.

This report includes field explorations, laboratory tests, general tunnel design guidelines and limitations.

FIELD EXPLORATION

Two additional exploratory borings were made at the site. The approximate locations of the borings are shown on the Revised Boring Location Sketch.

The borings were made with 4-in. diameter augers using finger-type bits and rotary drilling using carbide bits. Soil samples were recovered with 2 and 3-in. thin-wall tubes and a standard split spoon sampler driven with a 140-lb hammer falling 30 inches. Mudrock samples were recovered with an "NX" double tube core barrel with a carbide coring bit.

Also attached are the logs of some of the borings from our previous report, "Bougainville Industrial Park Off-site Sewers," dated April 11, 1975.

LABORATORY TESTS

Laboratory tests included: natural water content and density, Atterberg limit, grain-size analysis and unconfined compression.

A summary of the laboratory test results is given in Table 1C.

SOIL CLASSIFICATION SYSTEM

Soil samples were visually observed and subjected to appropriate tests in the laboratory. Based on visual observations and laboratory tests, the soil descriptions given on the boring logs are generally made in accordance with the "Unified Soil Classification System."

GEOLOGIC AND SOIL CLASSIFICATIONS BY OTHERS

From a review of geologic literature and the U. S. Soil Conservation Service maps of the area, the soils are generally described by others as follows:

Stearns, H. T. and U. S. Geological Survey, "Geologic and Topographic Map, Island of Oahu," USGS 1938:

Qht - Honolulu Volcanic Series
Consolidated volcanic tuff (locally called mudrock). Makalapa Crater was formerly a lake or pond according to the U.S.G.S. and the 1968 Quandrangle maps of the area.

U. S. Soil Conservation Service, "Soil Survey of Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii," August 1972:

MdB - Makalapa clay, 2 to 6% slopes
Unified Soil Classification - CH

KTKE - Kokokahi very stony clay, 0 to 35% slopes
Unified Soil Classification - CH

GENERAL SITE CONDITIONS

The proposed sewer alignment is about 3,600 ft in length and extends from Bougainville Road to Salt Lake Boulevard. The route crosses the back (westerly) portions of Hale Keiki School, Radford High School and Makalapa

Elementary School grounds. The proposed tunnel portion may extend for approximately 1,500 ft along the westerly portions of Makalapa Elementary School and Radford High School.

A 30-ft wide energy corridor and the H-1 Freeway are located on the west side of the proposed route. A shallow unlined ditch generally follows alongside the freeway and energy corridor.

A Navy utility tunnel crosses under the proposed sewer invert between Manhole Nos. 6 and 7. The existing tunnel is about 10 ft high and crosses about 8 ft below the proposed sewer invert. The tunnel is believed to be lined.

A track field, bleachers, floodlights, classroom building, parking lot, basketball court, Navy water lines and some concrete structures occur along the proposed route in back of (west) Radford High School and Makalapa Elementary School grounds.

INTERPRETATION OF SOIL CONDITIONS

From the field explorations and laboratory test results, the soils encountered in the borings may be generally approximated as follows:

Northern Portion (Manhole Nos. 5 thru 10)

About 3 to 15 ft of fill over dense mudrock (volcanic tuff) to below the proposed tunnel invert to 25 to 51 ft, the depth drilled.

Stiff clay was noted in 2 of the borings at about 35 to 37-ft depths, approximately 4 to 6 ft below the proposed invert.

Southern Portion (Manhole Nos. 11 and 12)

About 8 to 13 ft of fill over soft to medium clay to 33 to 37 ft. Below this: stiff clay to 36 to 41 ft, the depths drilled.

Water was not noted in the borings in the northern portion. Water was noted at about 10-ft depths in the southern portion (Manhole Nos. 11 and 12).

For more detailed descriptions of soils encountered in the borings, refer to the boring logs.

Variations to the above soil and water conditions are to be expected between borings and in localized areas.

DISCUSSION AND RECOMMENDATIONS

A 12-in. diameter gravity flow sewer line about 3,600 ft in length is proposed. A soil exploration report, "Bougainville Industrial Park Off-site Sewers, dated April 11, 1975, was prepared by our office for sewer pipe bedding design purposes. Due to the depths of the excavations (up to 38 ft) between Manhole Nos. 5 and 12, installation of a portion of the sewer by tunneling is being contemplated.

The profile of the ground starts at about elevation 33 ft at Manhole No. 5 and rises to about 58 ft at Manhole No. 6. Between Manhole Nos. 6 and 9, the ground varies from about 58 ft to 64 ft, then slopes down to about elevation 45 ft at Manhole No. 12.

The invert of the proposed sewer line generally varies from about elevation 26 ft at Manhole No. 5 to about elevation 30.5 ft at Manhole No. 12.

The tunnel diameter should be about 30 to 42 in. to allow personnel to enter the tunnel to lay the pipe.

For the proposed tunnel, between Sewer Manhole Nos. 5 and 12, the following may be considered:

Tunnel Lining

Manhole Nos. 5 thru No. 10

The borings indicate that the proposed tunnel will probably be mostly in mudrock (volcanic tuff).

The tunnel lining will depend mostly on the competency of the material encountered and the locations of any nearby structures.

Where dense mudrock is encountered, minimal or no supports may be required.

Linings should be considered for the adit and exit, about the first and last 15 ft of the tunnel, and where the new tunnel crosses over the existing Navy utility tunnel (see Figure 1). The lining may be corrugated metal pipe with the space between the lining and excavation filled with grout.

Where loose or ravelling pockets are encountered, the loose pockets may be grouted or mortared or supported with a metal liner and the space between the lining and ground filled with grout. The selection of the support should be made by the contractor to suit his judgment and requirements.

Manhole Nos. 10 thru 12

The borings indicate that the proposed sewer invert may be mostly in soft to medium clays and partly in mudrock.

Water was encountered in Boring Nos. 5 and 6.

Due to the soft material and possibility of encountering water if tunneling is considered, the tunneling should be done with care. A lining is recommended.

The borings indicate that the boundary between the mudrock and soft clays may be between Manhole Nos. 10 and 11.

Other general guidelines for tunneling and sewer pipe installation may be as follows:

1. In soft or ravelling ground, the lining should be placed as soon as practicable.

2. Where water is encountered, the tunnel should be drained before the installation of the sewer line.

3. For the sewer bedding, low-grade concrete or grout may be used.

Transition for Open Trench Method

If the sewer between Manhole Nos. 10 and 11 is placed by open trench method, a gradual transition for the pipe bedding in the mudrock formation and the clay should be considered. This may lessen the possibility of cracking the sewer pipe which will be partly supported on mudrock and partly on clay.

The transition zone may be constructed by overexcavating the mudrock from 0 ft at Manhole No. 10 to 3 ft at the boundary between mudrock and clay and backfilling the excavation with uncompacted select granular material.

Water

Water was not noted in the drill holes in the northern areas but was noted in the drill holes in the southern areas. Therefore, the possibility of encountering water should be considered.

Field Allowances

The contract documents should allow for field changes in tunnel lining, bedding, etc.

Unforeseen Conditions

Because of the variability of soil deposits, site improvements, designs and construction techniques, existing or changed conditions may be encountered that cannot be foreseen with even the most exhaustive studies of site and project conditions. These unforeseen conditions should be recognized when encountered and then evaluated so that the designs or the construction methods may be modified accordingly, if necessary.

Unforeseen or changed or undetected conditions such as soft spots, new or existing utility trenches, underground structures, pipes, voids or cavities, cesspools, boulders, expansive soil pockets, rubbish or boulder disposal pits, seepage water or water level changes with weather, etc., may occur in localized areas and will have to be adjusted and corrected in the field as they are detected.

Review of Plans, Specifications and Construction

Our basic scope of work does not include review of plans, specifications and construction observations.

It is recommended that the soil and foundation engineer review the final plans and specifications for general conformance with the earthwork and foundation guidelines of the soil report.

It is also recommended that the soil and foundation engineer be retained to provide engineering services during the foundation phases of the work. This will allow the soil engineer to observe general compliance with the design concepts, specifications or recommendations and to allow design changes in the event that subsurface conditions differ from that anticipated prior to start of construction.

In the event that changes in the nature, design or location of the project are planned, the recommendations contained in this report shall not be considered valid unless the changes are reviewed and the contents of this report modified or verified in writing.

FIELD LOGS/BORING LOGS

A field log was prepared for each boring by our technician. The log contains drilling information and the technician's interpretation of the soil conditions between samples. The copies are kept on file in our office for one year.

We must emphasize that our recommendations are based on the boring logs included in this report and the information contained thereon and not on the field logs.

The boring logs in this report represent our interpretation of the contents of the field logs, and the results of the laboratory observations and tests of the field samples.

The stratification lines shown on each of the boring logs represent the approximate boundary between soil types and the transitions may or may not be gradual.

Symbols

Soil symbols used generally are in accordance with the Unified Soil Classification System.

Where a parenthesis "(MH)" is used, the soil sample was classified by visual observation of the sample recovered.

Where no parenthesis "MH" is used, the soil sample was classified from either the Atterberg limit or grain-size analysis test results.

Rock Cores

The Rock Quality Designation (RQD) is based on a modified core recovery ratio.

This ratio is determined by considering only pieces of core that are 4-in. and longer and fairly hard. The percentage ratio between the total length of such cores recovered and the length of core drilled on a given run is designated as the RQD.

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: BOUGAINVILLE INDUSTRIAL PARK OFFSITE SEWERS

LOCATION: Halawa, Ewa, Oahu, Hawaii

Tax Map Key: 9-9-02: Por. 4, 23 & 34

HAMMER:
Weight: 140#
Drop: 30"

SAMPLER: 2"SS - 2" STANDARD SPLIT SPOON
3"S - 3" O.D. THIN WALL TUBE
"NX" - NX WIRE LINE CORE BARREL

BORING NO. 11 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date JUNE 17, 18 & 22, 1976
Field Party RACUYA, ASATO
Type of Boring AUGER (MOBILE B-50) CORING (CME 55) Diam. 4" & "NX"
Elev. 57'± * Datum —
Drill Bit T.C. FINGER, T.C. CORING
Water Level NOT NOTICED
Time —
Date 6-22-76

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40 / 3"O.D. THIN WALL TUBE
	ELEV. = 57'± ↓	0								
(SM)	DENSE, BROWN SILTY SAND W/ CORAL & GRAVEL (FILL?)		2"SS	II-A	—	9	—	—	—	60
(SM)	LOOSE, BROWN SILTY SAND W/TRACES OF CORAL & GRAVEL (FILL?)	5	2"SS	II-B	—	7	—	—	—	3 BLOWS/1.5'
			2"SS	II-C	—	16	—	—	—	59
(GM)	STIFF, BROWN CLAYEY SILT & DECOMPOSED ROCK, CORAL & GLASS (FILL?)	10								
			2"SS	II-D	—	25	—	—	—	
(CH)	SOFT, GRAY-BROWN CLAY					75		520		HYDRAULIC PRESSURE 300 PSI/1.5'
			3"S	II-E	—	37	—	—	—	
(MH)	SOFT, DARK GRAY SILTY CLAY W/MUDROCK	15					γ_W = 107, γ_D = 79			
	GRAY BROWN MUDROCK W/CLAYEY SILT		2"SS	II-F	—	40	—	—	—	40/0.3' HAMMER BOUNCES
	GRAY TAN MUDROCK & CLAYEY SILT	20	2"SS	II-G	—	31 29	—	—	—	42/0.3' HAMMER BOUNCES
	MOTTLED GRAY SILTY SAND & MUDROCK	25	2"SS	II-H	—	18	—	—	—	52/0.5'
		30	2"SS	II-I	—	28	—	—	—	50/0.5'
			"NX"	RUN #1		CORED: 2.0' RECOV.: 0.5' R.Q.D.: 25%				
MH-CH	STIFF, DARK BROWN SILTY CLAY (DECOMPOSED MUDROCK)	35	"NX"	RUN #2		CORED: 8.0' RECOV.: 4.0' R.Q.D.: 0%				
	END OF BORING @ 40' 6-22-76	40								

NOTE:
γ_W = WET DENSITY, P.C.F.
γ_D = DRY DENSITY, P.C.F.

*ELEVATION ESTIMATED FROM TOPO MAP BY COMMUNITY PLANNING, INC.

BOUGAINVILLE INDUSTRIAL PARK OFFSITE SEWERS

TABLE I C - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	10	10		11
SAMPLE NO.	E	H (TOP)		RUN #2
DEPTH BELOW SURFACE	35'-36.5'	50'-51.5'		32'-40'
DESCRIPTION	BROWN SILTY CLAY	MOTTLED GRAY SILTY SAND		DARK BROWN SILTY CLAY (DECOM. ROCK)
GRAIN-SIZE ANALYSIS (% Passing) Sieve				
1-1/2"		100		
1"		100		
1/2"		100		
#4		100		
#10		96.5		
#20		84.4		
#40		65.5		
#100		36.1		
#200		25.6		
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL			NATURAL
Liquid Limit	59			87
Plastic Limit	32			38
Plasticity Index	27			49
Dilatancy	NONE			SLOW
Toughness	STIFF			MED-STIFF
Dry Strength				
UNIFIED SOIL CLASSIFICATION	MH	SM		MH-CH
APPARENT SPECIFIC GRAVITY				
CBR TEST (Surcharge - 51 P.S.F.)				
Molding Moisture, %				
Molding Dry Density, P.C.F.				
Swell upon saturation, %				
CBR at 0.1" Penetration				
MOISTURE-DENSITY RELATIONS OF SOILS (ASTM D-1557-70, Method)				
Dry to Wet or Wet to Dry				
Max. Dry Density (P.C.F.)				
Optimum Moisture (%)				

REMARKS:

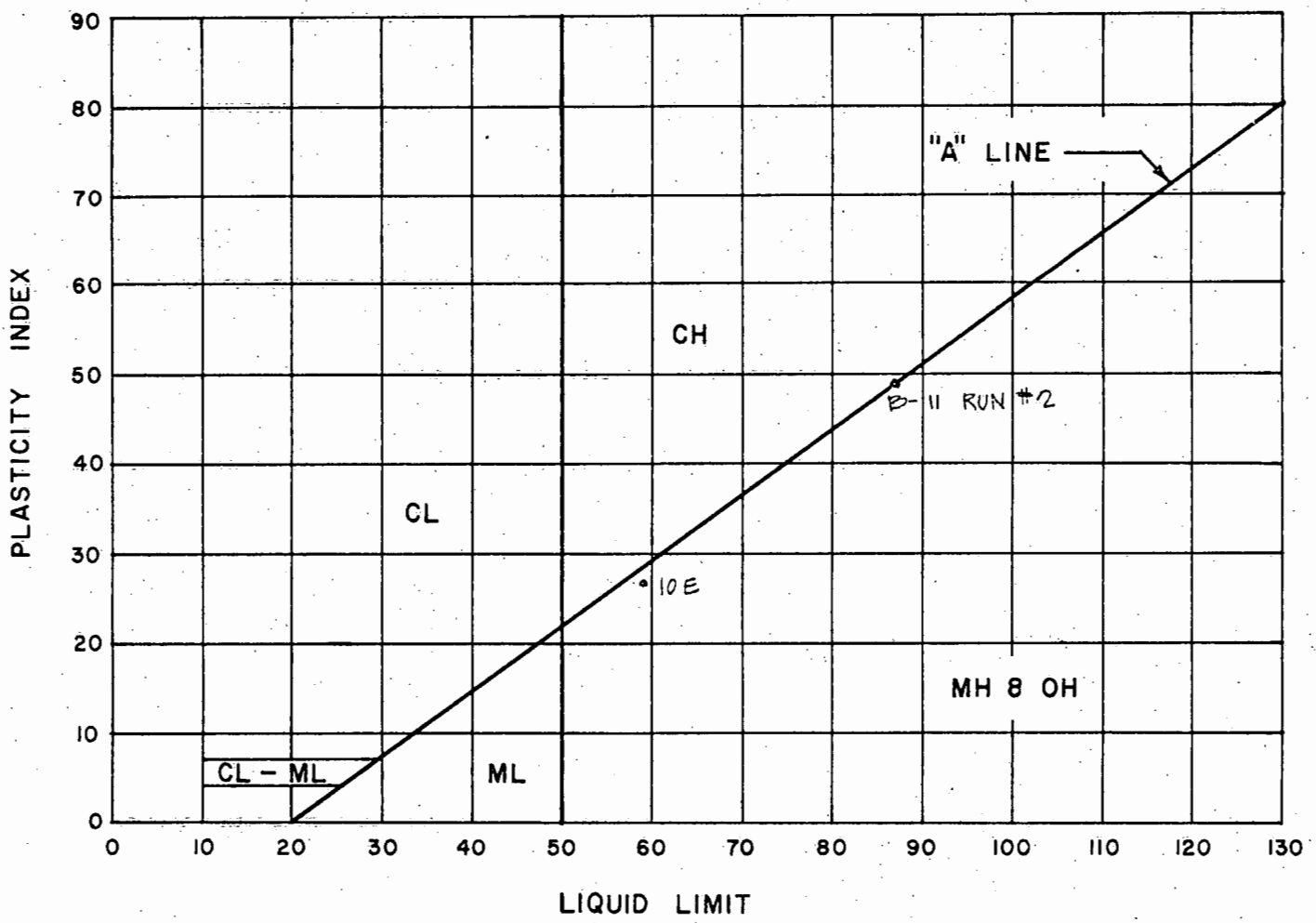
WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 7-15-76 By CM

PLASTICITY CHART

PROJECT: BOUGAINVILLE INDUSTRIAL PARK OFFSITE SEWERS

LOCATION: HALAWA, EWA, OAHU, HAWAII



DATE 7-15-76 BY CM

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

3-872

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: BOUGAINVILLE INDUSTRIAL PARK OFFSITE SEWERS

LOCATION: Halawa, Ewa, Oahu, Hawaii
Tax Map Key: 9-9-02: 2, 3, 18 & 25

HAMMER: Weight 140# Drop 30"

SAMPLER: 2" SS-2" STANDARD SPLIT SPOON; 3" S-3" O.D. THIN WALL TUBE

BORING NO. 5 Sheet No. ____ of ____

Driller W. LUM ASSOC., INC. Date FEBRUARY 27 TO MARCH 4, 1975

Field Party CHOW, KAU, SHIGENAGA, ASATO

Type of Boring AUGER (VERSA DRILL) Diam. 4"

Elev. 47'± * Datum —

Drill Bit T.C. DRAG

Water Level	NOT MEASURED	10'			
Time	3:45 PM	3:00 PM			
Date	3-3-75	3-4-75			

Unified Soil Classification	DESCRIPTION ELEV. = 47'±? *	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	3" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
(MH-CH)	STIFF, MOTTLED BROWN SILTY CLAY W/MUDROCK, DECOMPOSED ROCK, GRAVEL, SAND & SOME CORAL (FILL)		2"SS	5-A	-	22	-	-	-		
	COBBLE OR BOULDER	5									
			2"SS	5-B	NO	RECOVERY					30/0.0'
	NOTE: MOVED HOLE 4 TIMES. COBBLES & BOULDERS ENCOUNTERED										HAMMER BOUNCES
			WATER 3-4-75								
(MH-CH)	MEDIUM GRAY-BROWN SILTY CLAY	10	2"SS	5-C	-	70	-	-	-		
		15	3"S	5-D	-	80 γ_W = 98 γ_D = 54	-	-	900 1050 1060		2/0.5' 4/0.5' 4/0.5'
CH	SOFT TO MEDIUM GRAY BROWN, CLAY (PARTLY ORGANIC)	20	3"S	5-E	41	86 γ_W = 97 γ_D = 52	104	-	700 760		2/0.5' 2/0.5' 3/0.5'
		25	3"S	5-F	-	90 γ_W = 97 γ_D = 51	-	-	600 620		3/0.5' 3/0.5' 5/0.5'
(CH)	SOFT TO MEDIUM GRAY, CLAY	30	2"SS	5-G	-	56	-	-	-	1/0.5' 3/0.5'	
(CH)	MEDIUM, GRAY CLAY	35	2"SS	5-H	-	51	-	-	-		
(CH)	STIFF MOTTLED TAN BROWN CLAY W/TRACES OF DECOMPOSED ROCK	40	2"SS	5-I	-	50	-	-	-		
	END OF BORING @ 41.5' 3-4-75										

NOTE: γ_W = WET DENSITY, P.C.F.; γ_D = DRY DENSITY, P.C.F.

* Elevation estimated from topographic survey dated 6-5-74.

SELECTED LOGS OF BORINGS

FROM

BOUGAINVILLE INDUSTRIAL PARK OFF-SITE SEWERS

(DATED APRIL 11, 1976)

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: BOUGAINVILLE INDUSTRIAL PARK OFFSITE SEWERS

LOCATION: Halawa, Ewa, Oahu, Hawaii
Tax Map Key: 9-9-02: 2, 3, 18 & 25

HAMMER:
Weight: 140#
Drop: 30"

SAMPLER: 2"SS-2"STANDARD SPLIT SPOON
3"S-3"O.D.THIN WALL TUBE

BORING NO. 6 Sheet No. ____ of ____
Driller W.LUM ASSOC., INC. Date FEB. 26, 1975
Field Party SUZUKI, CHOW, ORITA
Type of Boring AUGER (MOBILE B-40) Diam. 4"
Elev. 52'± * Datum —
Drill Bit FINGER TYPE

Water Level	10.5				
Time	3:30 PM				
Date	2-26-75				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 3" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. = 52'±*	0									
(MH-CH)	STIFF, MOTTLED BROWN SILTY CLAY W/GRAVEL CORAL & SAND (FILL) COBBLE		2"SS	G-A	-	29	-	-	-		
(MH)	LOOSE, GRAY BROWN SILTY CLAY W/ SAND & GRAVEL (FILL) WOOD PIECE, CAVITY OR VOID 5'-7'	5	2"SS	G-B	-	14 31	-	-	-	1/2.0'	25/0.1'
(GC)	BROWN CLAYEY GRAVEL (FILL)	10	WATER 2-26-75								
	NOTE: MOVED HOLE 3 TIMES TO AUGER PASS 10.5' DEPTH. HIT SCRAP METAL(?) & BOULDER.		2"SS	G-C	-	24	-	-	-		
		15	2"SS	G-D	-	88	-	-	-	1/1.0' 1/0.5'	
(CH)	SOFT, LIGHT GRAY CLAY	20	3"S	G-E	NO RECOVERY						2 MAN PUSH/0.5' 3/0.5'
					NOTE: NO RECOVERY ON SECOND ATTEMPT WITH SPLIT SPOON						
		25	2"SS	G-F	-	81	-	-	-	2 MAN PUSH/1.5'	
(CH)	MEDIUM, GRAY CLAY	30	3"S	G-G	-	91 γ_W = 105 γ_D = 55	-	-	540		2 MAN PUSH/0.1' 3/0.5' 4/0.5'
(CH)	STIFF, GRAY CLAY	35	3"S	G-H	-	52 γ_W = 120 γ_D = 79	-	-	-		5/0.5' 12/0.5'
	END OF BORING @ 36' 2-26-75										

NOTE:
γ_W = WET DENSITY, P.C.F.
γ_D = DRY DENSITY, P.C.F.

* Elevation estimated from topographic survey dated 6-5-74.

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: BOUGAINVILLE INDUSTRIAL PARK OFFSITE SEWERS

LOCATION: Halawa, Ewa, Oahu, Hawaii

Tax Map Key: 9-9-02: 2, 3, 18 & 25

HAMMER: Weight 140# Drop 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 7 Sheet No. ____ of ____

Driller W. LUM ASSOC, INC. Date FEB. 25, 1975

Field Party SUZUKI, CHOW, ORITA

Type of Boring AUGER (MOBILE B-40) Diam. 4"

Elev. 61'± * Datum —

Drill Bit FINGER TYPE

Water Level	NOT NOTICED				
Time	—				
Date	2-25-75				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. ≈ 61'± *	0								
(ML-MH)	STIFF, REDDISH BROWN CLAYEY SILT			7-A	–	20	–	–	–	7/0.5'
(GM)	MEDIUM DENSITY, GRAY SILTY SAND, MUDROCK CHIPS & CORAL (FILL)					20				50/0.4'
	GRAY, MUDROCK W/SILTY SAND (FILL?)	5		7-B	–	20	–	–	–	50/0.2'
	GRAY BROWN MUDROCK W/SILTY SAND POCKETS	10		7-C	–	20	–	–	–	50/0.3'
		15		7-D	–	19	–	–	–	50/0.3'
	GRAY, MUDROCK W/GRAVEL	20		7-E	ROCK FRAGMENTS					50/0.2'
		25		7-F	–	25	–	–	–	50/0.3'
	GRAY MUDROCK W/SILTY SAND POCKETS	30		7-G	–	21	–	–	–	50/0.4'
		35		7-H	–	16	–	–	–	50/0.3'
(SM)	BROWN SILTY SAND W/MUDROCK	40		7-I	–	21	–	–	–	50/0.5'
		45								
(SM)	DENSE, BROWN SILTY SAND			7-J	–	40	–	–	–	42
		50		7-K	–	51	–	–	–	
SM	MEDIUM DENSITY BROWN, SILTY SAND					43				
	END OF BORING @ 51.5 2-25-75									

* Elevation estimated from topographic survey dated 6-5-74.

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: BOUGAINVILLE INDUSTRIAL PARK OFFSITE SEWERS

LOCATION: Halawa, Ewa, Oahu, Hawaii
Tax Map Key: 9-9-02: 2, 3, 18 & 25

HAMMER:
Weight 140#
Drop 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 8 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date MAR. 10 & 11, 1975
Field Party ASATO, SHIGENAGA, ORITA
Type of Boring AUGER (VERSA DRILL) Diam. 4"
Elev. 58'± * Datum —
Drill Bit T.C. DRAG

Water Level					
Time	—				
Date	3-10-75				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 58'± *	0								
(GM)	STIFF, BROWN CLAY & MUDROCK W/SAND (FILL)			8-A	-	29	-	-	-	
(SM)	DENSE, BROWN SILTY SAND & GRAVEL (MUDROCK?)	5		8-B	-	27	-	-	-	15/0.5' 30/0.3'
		10		8-C	-	24	-	-	-	50/0.3' HAMMER BOUNCES
	BROWN SILTY SAND & GRAVEL (MUDROCK)	15		8-D	-	24	-	-	-	50/0.3' HAMMER BOUNCES
		20		8-E	ROCK FRAGMENTS					50/0.2' HAMMER BOUNCES
		25		8-F	NO RECOVERY					50/0.2' HAMMER BOUNCES
	BROWN SILTY SAND & MUDROCK	30		8-G	-	43	-	-	-	50/0.3' HAMMER BOUNCES
		35		8-H	-	33	-	-	-	40/0.3'
CH	STIFF, BROWN CLAY	40		8-I	-	34	-	-	-	79
		45		8-J	-	44	-	-	-	
	END OF BORING @ 46.5' 3-11-75									

* Elevation estimated from topographic survey dated 6-5-74.

BOUGAINVILLE OFFSITE SEWER

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: BOUGAINVILLE INDUSTRIAL PARK OFFSITE SEWERS

LOCATION: Halawa, Ewa, Oahu, Hawaii
Tax Map Key: 9-9-02: 2, 3, 18 & 25

HAMMER:
Weight: 140#
Drop: 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 9 Sheet No. ____ of ____

Driller: N. LUM ASSOC., INC. Date: FEB. 27 & 28, 1975

Field Party: CHOW, KAU, SHIGENAGA

Type of Boring: AUGER (VERSA DRILL) Diam.: 4"

Elev.: 26'± * Datum: —

Drill Bit: T.C. DRAG

Water Level					
Time	—				
Date	2-28-75				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 26'± *	0								
(CH)	MEDIUM MOTTLED BROWN CLAY W/WOOD & DECOMPOSED ROCK (FILL)			9-A	—	32	—	—	—	
	DENSE, BROWN SILTY SAND & MUDROCK	5		9-B	—	27	—	—	—	40/0.5' HAMMER BOUNCES
(MH)	DENSE, BROWN SANDY SILT & DECOMPOSED MUDROCK	10		9-C	—	33	—	—	—	
(SM)	DENSE, MOTTLED BROWN SILTY SAND & DECOMPOSED MUDROCK	15		9-D	—	31	—	—	—	50/0.5'
	MOTTLED DARK GRAY DECOMPOSED MUDROCK W/LIGHT YELLOW CLAY POCKETS	20		9-E	—	50	—	—	—	50/0.4' HAMMER BOUNCES
	DARK GRAY MUDROCK	25		9-F	—	31	—	—	—	40/0.3' HAMMER BOUNCES
	END OF BORING @ 25.5' 2-28-75									

* Elevation estimated from topographic survey dated 6-5-74.

LIMITATIONS

In general, soil formations are commonly erratic and rarely uniform or regular. The boring logs indicate the approximate subsurface soil conditions encountered only at the drill holes where the borings were made at the times designated on the logs and may not represent conditions between borings, at other locations, or at other dates. Soil conditions and water levels may change with the weather, passage of time and construction methods or improvements at the site.

During construction, should subsurface conditions much different from those in the borings be observed, encountered, or otherwise indicated, we should be advised immediately to review or reconsider our recommendations in light of the new developments.

If there is a substantial lapse of time between the submission of this report and the start of work at the site, or if conditions have changed due to natural causes, plan changes, or construction operations at or adjacent to the site, it is recommended that this report be reviewed to determine the applicability of the recommendations considering the time lapse, changed conditions, and changes in the state of the art of soil engineering.

Our professional services were performed, findings obtained and recommendations prepared in accordance with generally accepted engineering practices. This warranty is in lieu of all other warranties expressed or implied.

LIMITATIONS (cont'd.)

Contract documents and specifications often prescribe supervision by the soil engineer. It should be understood by all parties that the soil engineer's actual scope of work is very limited. We as the soil engineer do not assume the day to day physical direction of the works, nor minute examination of the elements, nor do we assume the responsibility for the safety of the contractor's workmen. Supervision, inspection, control, etc., by the soil engineer generally mean taking of soil tests and making visual observations, sometimes on only an intermittent basis relating to earthwork or foundations for the project. The soil engineer does not guarantee the contractors' performance, but rather looks for general conformance to the intent of the plans and soil report. Any discrepancy noted by the soil engineer regarding earthwork or foundations will be referred to the project engineer or architect or contractor for action.

Although the soil report may comment or discuss construction techniques or procedures for the design engineer's guidance, the report should not be interpreted to prescribe or dictate construction procedures or to relieve the contractor in anyway of his responsibility for the construction.